Perspective

Sanitation Systems (/perspective/sanitation-systems-perspective)

Section

Sanitation Systems (/sanitation-systems/sanitation-systems)

Factsheet

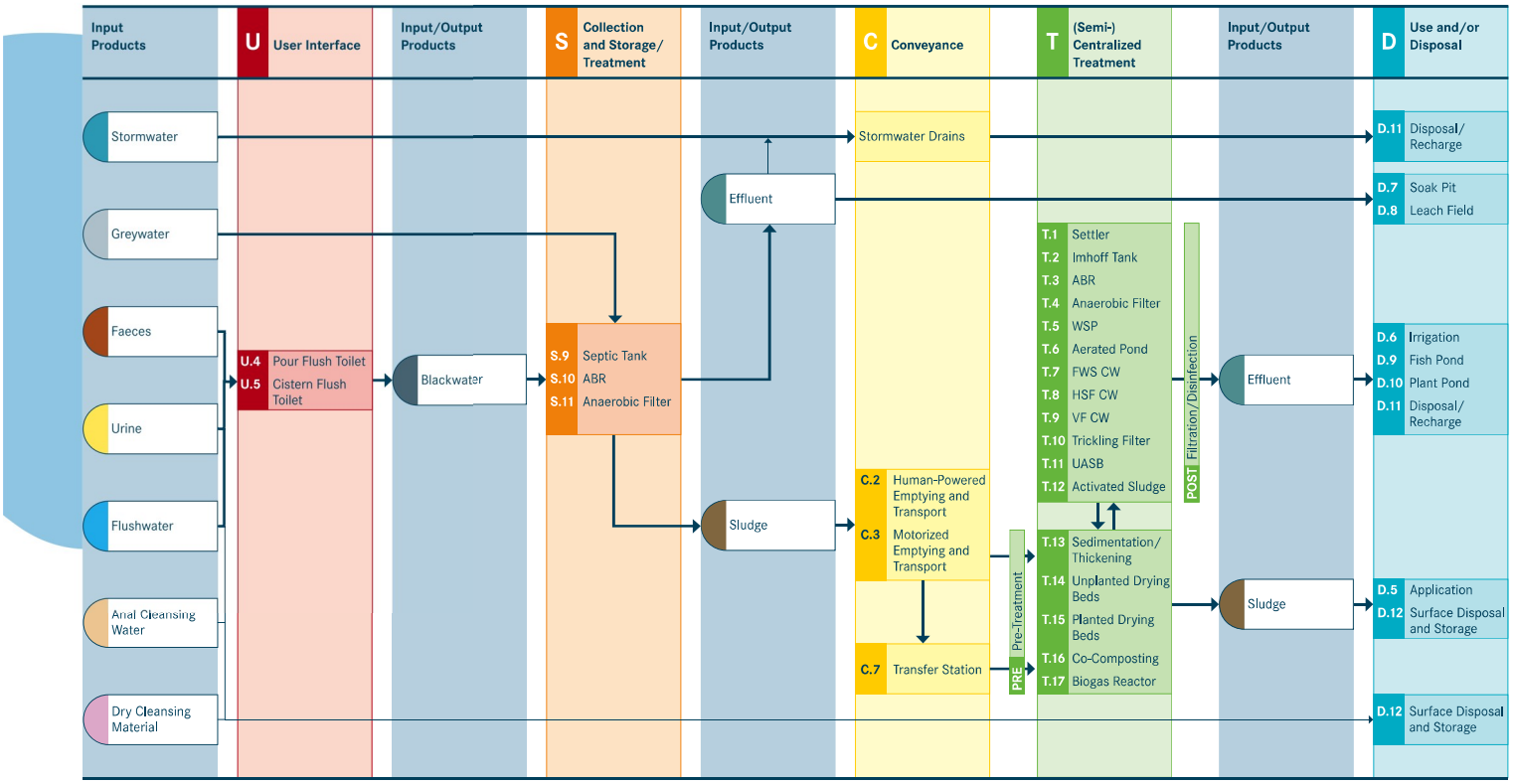
# System 6: Blackwater Treatment System with Infiltration

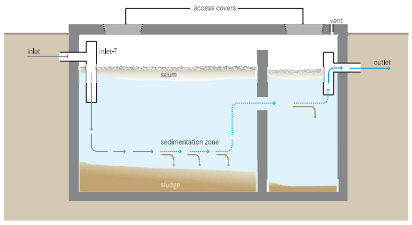
العربية (/ar/sanitation-systems/sanitation-systems/system-6:-blackwater-treatment-system-with-infiltration)

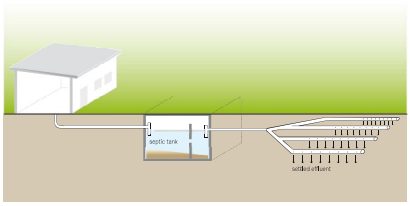
Author/Compiled by
Eawag (Swiss Federal Institute of Aquatic Science and Technology)

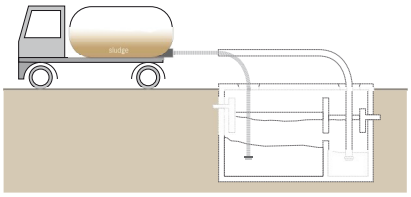
## Adapted from

**Compendium of Sanitation Systems and Technologies. 2nd Revised Edition (/node/5587)**










This is a water-based system that requires a flush toilet and a **Collection and Storage/Treatment (/sanitation-technologies#group-s)** technology that is appropriate for receiving large quantities of water. Inputs to the system can include Faeces, Urine, Flushwater, Anal Cleansing Water, Dry Cleansing Materials and Greywater. There are two **User Interface (/sanitation-technologies#group-u)** technologies that can be used for this system: a **Pour flush Toilet (/sanitation-systems/sanitation-technologies/pour-flush-toilet)** or a **Cistern Flush Toilet (/sanitation-systems/sanitation-technologies/cistern-flush-toilet)**. A **Urinal (/sanitation-systems/sanitation-technologies/urinal)** could additionally be used. The **User Interface (/sanitation-technologies#group-u)** is directly connected to a **Collection and Storage/Treatment (/sanitation-technologies#group-s)** technology for the Blackwater that is generated: either a **Septic Tank (/sanitation-systems/sanitation-technologies/septic-tank)**, an **Anaerobic Baffled Reactor (ABR) (/sanitation-systems/sanitation-technologies/anaerobic-baffled-reactor-(abr))**, or an **Anaerobic Filter (/sanitation-systems/sanitation-technologies/anaerobic-filter)** may be used. The anaerobic processes reduce the organic and pathogen load, but the Effluent is still not suitable for direct use. Greywater should be treated along with Blackwater in the same **Collection and Storage/Treatment (/sanitation-technologies#group-s)** technology, but if there is a need for water recovery, it can be treated separately (this is not shown on the system template).

Effluent generated from the **Collection and Storage/Treatment (/sanitation-technologies#group-s)** can be directly diverted to the ground for **Use and/or Disposal (=/sanitation-technologies#group-d)** through a **Soak Pit (/sanitation-systems/sanitation-technologies/soak-pit)** or a **Leach Field (/sanitation-systems/sanitation-technologies/leach-field)**. Although it is not recommended, the Effluent can also be discharged into the Stormwater drainage network for **Water Disposal / Groundwater Recharge (/sanitation-systems/sanitation-technologies/water-disposal-/-groundwater-recharge)**. This should only be considered if the quality of the Effluent is high and if there is no capacity for onsite infiltration or transportation offsite.

The Sludge that is generated from the **Collection and Storage/Treatment (/sanitation-technologies#group-s)** technology must be removed and transported for further treatment. The **Conveyance (/sanitation-technologies#group-c)** technologies that can be used include **Human-powered Emptying and Transport (/sanitation-systems/sanitation-technologies/human-powered-emptying-and-transport)** or **Motorised Emptying and Transport (/sanitation-systems/sanitation-**

**technologies/motorised-emptying-and-transport)**. As the Sludge is highly pathogenic prior to treatment, human contact and direct agricultural application should be avoided. The Sludge that is removed should be transported to a dedicated Sludge treatment facility (**Sedimentation/ Thickening Ponds (/sanitation-systems/sanitation-technologies/sedimentation/-thickening-ponds)**, **Unplanted Drying Beds (/sanitation-systems/sanitation-technologies/unplanted-drying-beds)**, **Planted Drying Beds (/sanitation-systems/sanitation-technologies/planted-drying-beds)**, **Co-Composting (/sanitation-systems/sanitation-technologies/co-composting)**, **Biogas Reactor (/sanitation-systems/sanitation-technologies/biogas-reactor)**). In the event that such a facility is not easily accessible, the Sludge can be discharged to a **Transfer Station (Underground Holding Tank) (/sanitation-systems/sanitation-technologies/transfer-station-(underground-holding-tank))**. From the Transfer Station it will then be transported to the treatment facility by a motorized vehicle (**Motorised Emptying and Transport (/sanitation-systems/sanitation-technologies/motorised-emptying-and-transport)**).

A technology selection tree for Sludge treatment plants is provided in Strande et al., 2014 (see Sector Development Tools, p. 8). **(Semi-) Centralized Treatment technologies (/sanitation-technologies#group-t)** produce both Effluent and Sludge, which may require further treatment prior to **Use and/or Disposal (/sanitation-technologies#group-d)**. For example, Effluent from a Sludge treatment facility could be co-treated with wastewater in **Waste Stabilization Ponds (WSP) (/sanitation-systems/sanitation-technologies/waste-stabilization-ponds-(wsp))** or Constructed Wetlands (**Free-Water Surface Constructed Wetland (/sanitation-systems/sanitation-technologies/free-water-surface-constructed-wetland)**, **Horizontal Subsurface Flow Constructed Wetland (/sanitation-systems/sanitation-technologies/horizontal-subsurface-flow-constructed-wetland)**, **Vertical Flow Constructed Wetland (/sanitation-systems/sanitation-technologies/vertical-flow-constructed-wetland)**).

Options for the **Use and/or Disposal (/sanitation-technologies#group-d)** of the treated Effluent include **Irrigation (/sanitation-systems/sanitation-technologies/irrigation)**, **Fish Pond (Aquaculture) (/sanitation-systems/sanitation-technologies/fish-pond-(aquaculture))**, **Floating Plant Pond (/sanitation-systems/sanitation-technologies/floating-plant-pond)** or discharge to a water body (**Water Disposal / Groundwater Recharge (/sanitation-systems/sanitation-technologies/water-disposal-/-groundwater-recharge)**). After adequate treatment, Sludge can either be used in agriculture (**Application of Sludge (/sanitation-systems/sanitation-technologies/application-of-sludge)**) or brought to a Storage/Disposal site (**Surface Disposal and Storage (/sanitation-systems/sanitation-technologies/surface-disposal-and-storage)**).

## Considerations

This system is only appropriate in areas where desludging services are available and affordable and

where there is an appropriate way to dispose of the Sludge. For the infiltration technologies to work there must be sufficient available space and the soil must have a suitable capacity to absorb the Effluent. If this is not the case, refer to **System 7: Blackwater Treatment System with Effluent Transport (/humanitarian-crises/camps/sanitation/sanitation-systems/system-7:-blackwater-treatment-system-with-effluent-transport)**. This system can be adapted for use in colder climates, even where there is ground frost. The system requires a constant source of water.

This water-based system is suitable for Anal Cleansing Water inputs, and, since the solids are settled and digested onsite, easily degradable Dry Cleansing Materials can also be used. However, rigid or non-degradable materials (e.g., leaves, rags) could clog the system and cause problems with emptying and, therefore, should not be used. In cases when Dry Cleansing Materials are collected separately from the flush toilets, they should be disposed of in an appropriate way (e.g., **Surface Disposal and Storage (/sanitation-systems/sanitation-technologies/surface-disposal-and-storage)**).

The capital investment for this system is considerable (excavation and installation of an onsite storage and infiltration technology), but the costs can be shared by several households if the system is designed for a larger number of users.

**Guidelines for the safe use of wasterwater excreta and greywater. Volume IV. Excreta and Greywater Use in Agriculture (/node/1133)** have been published by the World Health Organization (WHO) and are referenced on the relevant technology information sheets.

## Library References

### Compendium of Sanitation Systems and Technologies. 2nd Revised Edition

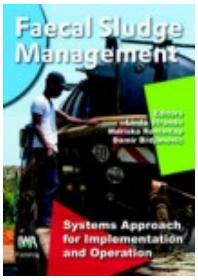
This compendium gives a systematic overview on different sanitation systems and technologies and describes a wide range of available low-cost sanitation technologies.

TILLEY, E. ULRICH, L. LUETHI, C. REYMOND, P. ZURBRUEGG, C. (2014): Compendium of Sanitation Systems and Technologies. 2nd Revised Edition. Duebendorf, Switzerland: Swiss Federal Institute of Aquatic Science and Technology (Eawag) **URL (http://www.eawag.ch/forschung/sandec/publikationen/compendium_e/index_EN)** [Accessed: 28.07.2014] **PDF (/sites/default/files/reference_attachments/TILLEY%20et%20al%202014%20Compendium%20of%20Sanitation%20Systems%20and%20Tec**

**(/sites/default/files/reference_attachments/TILLEY%20et%20al%202014%20Compendium%20of%20Sanitation%20Systems%20and%20Tec**

**/TILLEY%20et%20al%202014%20Compendium%20of%20Sanitation%20Systems**

**Faecal Sludge Management**

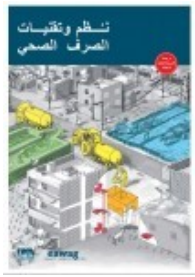



This is the first book to compile the current state of knowledge on faecal sludge management. It addresses the organization of the entire faecal sludge management service chain, from the collection and transport of sludge, to the current state of knowledge of treatment options, and the final end use or disposal of treated sludge. It presents an integrated approach that brings together technology, management, and planning, based on Sandec's 20 years of experience in the field. It also discusses important factors to consider when evaluating and upscaling new treatment technology options. The book is designed for undergraduate and graduate students, engineers, and practitioners in the field who have some basic knowledge of environmental and/or wastewater engineering.

STRANDE, L. ; RONTELTAP, M. ; BRDJANOVIC, D. (2014): Faecal Sludge Management. Systems Approach for Implementation and Operation. London: IWA Publishing **URL (http://www.sandec.ch/fsm_book)** [Accessed: 16.07.2014]

## Further Readings

**Compendium of Sanitation Systems and Technologies (Arabic)**



This is the Arabic version of the Compendium of Sanitation Systems and Technologies. The Compendium gives a systematic overview on different sanitation systems and technologies and describes a wide range of available .low-cost sanitation technologies

TILLEY, E. ULRICH, L. LUETHI, C. REYMOND, P. SCHERTENLEIB, R. ZURBRUEGG, C. (2014): Compendium of Sanitation Systems and Technologies (Arabic). 2nd Revised Edition. Duebendorf, Switzerland: Swiss Federal Institute of Aquatic Science and Technology (Eawag) **PDF (/sites/default/files/reference_attachments/TILLEY%20et%20al%202014%20Arabic%20Compendium%20of%20Sanitation%20Systems.pdf)**